REMARKS

Claims 1-28 are in the case. Claims 1-28 stand rejected. By this paper, claims 1, 2, 7, 20, and 21 have been amended. For the reasons set forth below, claims 1-28 are believed to be in a condition for allowance. Applicant submits this request for reconsideration in accordance therewith. Applicant also requests favorable consideration of new claims 29-32, which have been added to more particularly point out and distinctly claim the subject matter Applicant regard as his invention.

OBJECTION TO THE DISCLOSURE

The disclosure stands objected to for a typographical numbering error. By this paper, the paragraph in which the error occurs has been amended to remove the error. Accordingly, Applicant requests withdrawal of the objection.

REJECTION OF CLAIMS 1-28 UNDER 35 U.S.C. §112, SECOND PARAGRAPH

Claims 1-28 stand rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as his invention. More specifically, claims 1, 2, 7, 9, 20, and 21 were rejected as containing terms that lacked antecedent basis, and their dependents were rejected accordingly. By this paper, claims 5, 6, 9, and 10 have been cancelled. Claims 1, 2, 7, 20, and 21 have been amended to ensure that antecedent basis is found for all terms. Consequently, Applicant respectfully requests withdrawal of the rejection under §112.

REJECTION OF CLAIMS 1-3, 5-6, 9-10, 15-19, 21-22, AND 28 UNDER 35 U.S.C. §102(b)

Claims 1-3, 5-6, 9-10, 15-19, 21-22, and 28 stand rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,537,568 to Yanai et al. Claims 5-6 and 9-10 have been cancelled. With respect to claims 1-3, 15-19, 21-22, and 28, Applicant respectfully asserts that the Examiner has not made a *prima facie* case of anticipation. To establish a rejection under 35 U.S.C. §102(b), all claim limitations must be disclosed in a single prior art reference. See MPEP §2131. Significant limitations of Applicant's independent claims are not found in Yanai; consequently, a *prima facie* case of anticipation has not been established.

More specifically, Applicant's first claim recites "providing a model of data elements stored within the cache". One definition of a "model," as provided by www.dictionary.com, is "a work or construction used in testing or perfecting a final product." This is the applicable definition of "model," as used in claim 1. This definition is established by the recitation of "making a cache management decision based upon the model" in claim 1. The model spoken of in claim 1 is not simply a representation of the cache, but is used to tune the dynamic operation of the cache by making cache management decisions.

Applicant finds no disclosure of such a model in Yanai. Rather, the passage cited by the Examiner discloses "an associated cache index/directory 16 which serves to provide an indication of the data which is stored in the cache memory and provide the address of the data in the cache." Yanai, column 4, lines 48-51. The index/directory 16 is simply a lookup table with raw data that describe the contents of the cache. The index/directory 16 provides no method for measuring performance. Therefore, such an index/directory is not a model upon which cache

management decisions are based, as recited in claim 1. Hence, Applicant respectfully asserts that claim 1, as amended, is allowable.

Claims 2-3 and 15-19 depend from claim 1. Applicant asserts that these claims are allowable as being dependent from an allowable base claim. Furthermore, claims 2-3 and 15-19 contain a number of additional novel features that have not been given due patentable weight by the Examiner. For the sake of brevity, these features will not be discussed in this paper.

Claim 21, as amended, recites "a modeling module operating within the remote prefetch module configured to model the cache." "Modeling," as used in claim 21, is the creation of a work or construction used in testing or perfecting a final product. Within the context of claim 21, "modeling" includes the process of determining "whether to schedule a prefetch of data into the cache," because the modeling module is "operating within the remote prefetch module."

The text cited by the Examiner as disclosing a modeling module relates to "a cache data replacer, which is responsive to a user supplied selectable predetermined maximum number of sequential data elements which are to be stored in the cache memory for a given process." Yanai, column 2, lines 39-42. The cache data replacer does not perform modeling, as used in claim 21.

Specifically, Applicant finds no disclosure that the cache data replacer has a role in scheduling prefetches into the cache. Rather, the cache data replacer is provided "for replacing or over-writing the least recently used sequential data elements in excess of the predetermined maximum number of elements established by the process parameters set up by the user." Yanai, column 2, lines 42-45. The cache data replacer appears to be simply a cache management routine designed to free space within the cache. Yanai does not disclose that the cache data replacer is in any way used to schedule prefetches of new data into the cache.

Hence, Applicant respectfully asserts that the cache data replacer does not disclose a "modeling module" within the meaning of claim 21. Consequently, claim 21 is not anticipated by Yanai, and Applicant respectfully asserts that claim 21 is allowable. Claims 22 and 28 depend from claim 21 and are allowable as being dependent from an allowable base claim. Furthermore, claims 22 and 28 contain additional novel features that have not been given due patentable weight by the Examiner. For the sake of brevity, these features will not be discussed in this paper.

For the foregoing reasons, Applicant believes that claims 1-3, 15-19, 21-22, and 28 are in a condition for allowance. Hence, Applicant respectfully requests withdrawal of the rejection of claims 1-3, 15-19, 21-22, and 28 under §102(b).

REJECTION OF CLAIM 7 UNDER 35 U.S.C. §103 OVER YANAI IN VIEW OF KUROKAWA

Claim 7 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Yanai in view of Japanese Patent No. JP 04-367954 to Kurokawa. For the foregoing reasons, Applicant believes claim 1, as amended, to be in a condition for allowance. Applicant respectfully asserts that claim 7 is also allowable as being dependent from an allowable base claim. Furthermore, claim 7 may be patentable for reasons independent of the patentability of claim 1. For the sake of brevity, these reasons will not be presented herein. Applicant respectfully requests withdrawal of the rejection of claim 7 under §103(a).

REJECTION OF CLAIM 8 UNDER 35 U.S.C. §103(a) OVER YANAI IN VIEW OF MCNUTT

Claim 8 stands rejected under 35 U.S.C. §103(a) over Yanai in view of U.S. Pat. No. 5,606,688 to McNutt et al. For the foregoing reasons, Applicant believes claim 1, as amended, to be in a condition for allowance. Applicant respectfully asserts that claim 8 is also allowable as being dependent from an allowable base claim. Furthermore, claim 8 may be patentable for reasons independent of the patentability of claim 1. For the sake of brevity, these reasons will not be presented herein. Applicant respectfully requests withdrawal of the rejection of claim 8 under §103(a).

REJECTION OF CLAIMS 11-13 AND 25-27 UNDER 35 U.S.C. §103(a) OVER YANAI IN VIEW OF DIXION

Claims 11-13 and 25-27 stand rejected under 35 U.S.C. §103(a) over Yanai in view of U.S. Pat. No. 4,490,782 to Dixion et al. For the foregoing reasons, Applicant believes claims 1 and 21, as amended, to be in a condition for allowance. Applicant respectfully asserts that claims 11-13 and 25-27 are also allowable as being dependent from allowable base claims. Furthermore, claims 11-13 and 25-27 may be patentable for reasons independent of the patentability of claims 1 and 21. For the sake of brevity, these reasons will not be presented herein. Applicant respectfully requests withdrawal of the rejection of claims 11-13 and 25-27 under §103(a).

REJECTION OF CLAIMS 4 AND 23 UNDER 35 U.S.C. §103(a) OVER YANAI IN VIEW OF TIPLEY

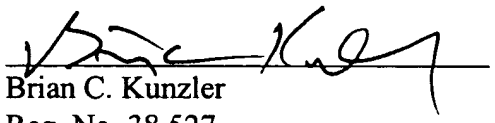
Claims 4 and 23 stand rejected under 35 U.S.C. §103(a) over Yanai in view of U.S. Pat. No. 5,606,688 to Tipley et al. For the foregoing reasons, Applicant believes claims 1 and 21, as amended, to be in a condition for allowance. Applicant respectfully asserts that claims 4 and 23 are also allowable as being dependent from allowable base claims. Furthermore, claims 4 and 23 may be patentable for reasons independent of the patentability of claims 1 and 21. For the sake of brevity, these reasons will not be presented herein. Applicant respectfully requests withdrawal of the rejection of claims 4 and 23 under §103(a).

OBJECTION TO CLAIMS 14 AND 24

Claims 14 and 24 stand objected to as being dependent upon a rejected base claim. For the foregoing reasons, Applicant believes claims 1 and 21, as amended, to be in a condition for allowance. Thus, Applicant respectfully requests withdrawal of the objection to claims 14 and 24.

Reconsideration of claims 1-28 is respectfully requested. New claims 29-32 are also believed to be in a condition for allowance for the reasons described above in connection with claims 1 and 21. If the Examiner finds any remaining impediment to the prompt allowance of all claims, Applicant respectfully requests that the Examiner call the undersigned.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

Please replace the paragraph beginning on page 11, line 8, with the following:

Each of the objects 230 preferably contains information about an individual data element of the cache 42 of Figure 1. In one embodiment, each object 230 stores a header [230]232 identifying the data element modeled by the object 230. Each object 230 may also store a history 234 of the represented data element. In one embodiment, the history 234 is represented by a priority value 236 assigned to the data element. A marker 238 indicating whether the data element 223 was stored as a result of a prefetch operation or not may also be stored within the object 230. A time stamp 240 indicating when a data element first entered the cache is also preferably present within each object 230. Of course, other data that may be needed to accurately model each data element that resides within the cache 42 of Figure 1 may likewise be stored in or with the objects 230.

IN THE CLAIMS

Please amend claims 1, 2, 7, 20, and 21, as follows:

1. A method for scheduling prefetches into a cache of a data storage system, the method comprising:

remotely modeling [the] dynamic operation of the cache;

the remotely modeling including providing a model of data elements stored within the cache; and

making a cache management decision based upon the model.

2. The method of claim 1, wherein making a cache management decision comprises:

intercepting a request for a data element from a stream of Input/Output (I/O) data requests passed between a host and a storage device of the data storage system; and

determining whether to schedule a prefetch of a data element logically successive to the requested data element in accordance with [the] contents of the cache as indicated by the model.

7. The method of claim 1, wherein remotely modeling the cache further comprises:

determining [the]a size of the cache;

periodically fetching [the]an I/O rate of the cache; and

periodically fetching [the]a hit rate of the cache.

20. A method for scheduling prefetches in a data storage system having a host and a cache, the method comprising the steps of:

providing a cache for caching Input/Output (I/O) data;

providing a prefetch module remote to the cache;

remotely modeling the cache within the prefetch module and determining whether to schedule a prefetch of data into the cache according to the results of the step of remotely modeling the cache, the step of remotely modeling the cache module further comprising:

examining the history of a data element in the cache;

assigning a priority value to the data element according to its history;

comparing that priority value to a predetermined threshold value;

determining [the]a size of memory used in the cache;

periodically fetching [the]an I/O rate of the cache from the cache;

periodically fetching [the]a hit rate of the cache from the cache; and

determining a single reference residency time for a data element within the cache;

intercepting a stream of I/O information from the host to the cache to locate a requested data element;

determining if the requested data element in the stream of I/O information is already present within the cache;

making the requested data element [the]a youngest member of the cache;

determining if the data element preceding the requested data element is present in the cache;

assigning a priority value to the requested data element;

periodically reevaluating the performance of the cache versus an internal model of the cache if the number of I/O requests received by the cache is greater than a predetermined number;

updating the dynamic threshold used in the internal model of the cache if the dynamic threshold value does not adequately model the performance of the cache;

comparing the priority value of the requested data element with the dynamic threshold value; and

prefetching the requested data element if the priority value of the requested data element is greater than the dynamic threshold value by passing an I/O request of the data element to the cache.

21. A data prefetch scheduling system comprising:

a cache configured to communicate with a host; and

a remote prefetch module configured to communicate with the host and the cache and configured to determine whether to schedule a prefetch of data into the cache; and

a modeling module operating within the remote prefetch [scheduling] module configured to model the cache.